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Response of different levels of sulphur and zinc fertilization on yield and uptake of nutrients by groundnut

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ABSTRACT

Response of different levels of sulphur and zinc on uptake of nutrients by *kharif* groundnut was studied in a pot culture experiment. The pot trial was laid out in a factorial completely randomized design. Application of 120 kg S ha^{-1} as elemental sulphur significantly increased the pod yield as well as uptake of N, P, K, Ca and Mg by groundnut kernel showing its synergistic effects on uptake of these nutrients. Among the various levels of zinc, application of 40 kg ha^{-1} exerts significantly highest pod yield and application of 20 kg ha^{-1} resulted in significantly increased uptake of N, P, K, Ca and Mg exhibiting synergistic effect at lower level and antagonistic effects at higher level. Sulphur application at 120 kg ha^{-1} along with 20 kg Zn ha^{-1} proved the best and superior combination resulting into significant increase in the groundnut pod yield as well as uptake of N, P, K, Ca and Mg by kernel at harvest. Interaction effects of various levels of S and Zn were non significant in respect of pod yield and nutrient uptake.

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Sulphur deficiency is becoming more critical with each passing year which is severely restricting crop yield, produce quality, nutrient use efficiency and economic returns. Sulphur, therefore, now has become a part of balanced fertilization because in S deficient areas, applying N, P and K only, even at recommended rates cannot produce high yield unless sulphur is also applied. S deficiencies can only be corrected by the application of sulphur fertilizer. Several workers reported increased yield as well as uptake of nutrients due to S application (Jaggi *et al.,* 1995; Anwar *et al.,* 2002).

Zinc, one of the micro nutrients plays an important role in balanced nutrition of oilseed crops and is helpful for N fixation. Revathi *et al.* (1996) observed significant increase in nutrient uptake due to Zn application. Interaction between these two nutrients on yield and nutrient uptake was more striking, hence the present investigation was carried out.

MATERIALS AND METHODS

The experimental soil was clay loam in texture with pH 7.9, EC 0.47 dS m^{-1}, organic carbon-6.8%, $CaCO_3$ 7%, available N, P and K as 242, 25 and 363 kg ha^{-1}, respectively, and sulphur 5 ppm (deficient) and zinc 0.5 ppm (deficient). The experiment was conducted in a factorial completely randomized design with sixteen treatments replicated twice in the cement pots. Groundnut (cv. JL-24) was the test crop for the study. The basal dose of 20 kg N and 40 kg P_2O_5 ha^{-1} was applied through urea and single super phosphate, respectively, before sowing to all the pots by thoroughly mixing it with soil. Sulphur as elemental sulphur @ 0, 40, 80 and 120 kg ha^{-1} and zinc as zinc oxide @ 0, 20, 40 and 60 kg ha^{-1} were applied separately and in combination. Three seeds of groundnut per pot were grown up to maturity with proper watering, weeding and adopting proper plant protection measures. At harvest pod yield was recorded. Kernels were used for recording nutrient uptake studies. The samples were digested in concentrated H_2SO_4 : H_2O_2 (1:1) mixture as per the method described by Parkinson and Allen (1975). This extract was used for the determination of N. Kernel sample digested in HNO_3 : $HClO_4$ (9 : 4) mixture separately (Johnson and Ulrich, 1959) were used for the determination of P, K, Ca and Mg following standard methods. The data recorded were statistically analyzed as per method described by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Pod yield:

The data in the table 1 reveals that the pod yield increased with increase in S levels. Application of 120 kg S ha^{-1} recorded significantly highest pod yield (8.98 g $plant^{-1}$) and it was *at par* with 80 kg S ha^{-1} (8.61 g $plant^{-1}$), being 28.95% and 25.86% higher over control, respectively. The response to higher levels of sulphur application might be due to reduction in soil pH which resulted in increasing availability of S causing higher yield